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硕 士 学 位 论 文

基于内容的交通视频检索系统算法研究

Research on the Algorithms
for Content-Based Vehicle Video Retrieval System

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摘　要

基于内容的交通视频检索技术是在不需要人的干预，或者只需要很少干预的情况下，通过对摄像机拍录的视频进行分析，提取车辆的流量，速度，颜色，外形等特征存入数据库中，并能在事后或在线依照用户的要求检索到特定的车辆。基于内容的交通视频检索系统不仅能够为城市的交通规划提供了第一手的统计学数据，也可为交通监管部门追查交通违章和交通肇事车辆提供了极大的便利。

本文围绕基于内容的交通视频检索系统的实现中几个难点做了比较深入的研究，提出了一些新的算法。主要的工作和贡献有：

1．运动车辆检测。提出了一种动态更新背景模型的方法，并针对高架摄像机的抖动问题做了优化。提出了基于高斯概率的阴影检测算法和基于轮廓投影定位车体的方法。实验表明，综合应用几种算法能够得到令人满意的结果。

2．运动车辆跟踪。结合时域和空间特征对运动车辆进行匹配；把跟踪过程将要处理的问题归结为三类：良好匹配，车辆遮挡和新车辆加入，并分别设计处理策略。实验表明该跟踪模型能够有效的实现交通场景中多车辆的实时跟踪，并且保持较好的跟踪性能的稳定性。

3．车辆特征提取与检索。提出了基于车辆运动过程的关键帧提取方法。利用关键帧并结合先验知识，能够获取车辆的颜色、形状、大小、速度、行驶方向和进出时间等特征。在检索模块，实现了多种特征的综合检索。实验表明，能够较为准确地检索到所需的车辆信息。

关键词：交通流检测；车辆跟踪；视频检索

Abstract

Content-Based Traffic Video Retrieval System is a human-effort-spared technique by which the vehicle features, such as the traffic volume, speed, color, shape of vehicles, etc., are to be extracted by processing and analyzing the traffic video captured by cameras. These traffic features are extracted and stored in a database together with the accompanied video, and then people can search for the information of a vehicle by specifying features on-line or off-line. Not only could this technique provide the first-hand statistical and essential data for metropolitan traffic planning scheme, but also could provide an efficient and convenient tool for a transportation section in investigating vehicles that break traffic regulations.

In the thesis, a number of novel algorithms for Content-Based Vehicle Video Retrieval System are presented based on our researches and experiments. Our work contributes to the following aspects:

(1) **Detection of moving vehicles.** We propose a dynamical method of renovating the model of background, and provide a better solution to the problem of video shaking unsteadily captured by camera. We also work out an algorithm to detect the vehicle shadows based on Gauss-probability, and a method of detecting vehicles based on the outline of shadow. The experiments showed that using of these algorithms is comprehensive and effective.

(2) **Tracking of moving vehicles.** We match the moving vehicles by combining time and spatial characteristics, and classify the problems into the following three cases: well matched, shadowed, and joined in of a new vehicle. For each case, we give a strategy to handle it. The experiments showed that using the above strategies we can follow multi-vehicles effectively and steadily in real time.

(3) **Extracting and retrieving the features of vehicles.** We work out a method base on extracting the key frames of the traffic video for moving vehicles. Using the method and combining with some reasonable pre-assumed information about the traffic flow, we can acquire the features of vehicles such as color, shape, size, speed, direction, the time of getting in and out, etc. Our experiments showed that we can get comparative exact information of the vehicles we need.

Key Words: Traffic Flow Detection; vehicle tracking; video retrieval

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